U.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/006,959	11/05/2001	Todd D. Creger	00-608	2767

719 7590 09/07/2006

CATERPILLAR INC.
100 N.E. ADAMS STREET
PATENT DEPT.
PEORIA, IL 616296490

EXAMINER	
DAY, HERNG DER	
ART UNIT	**PAPER NUMBER**
2128	

DATE MAILED: 09/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/006,959
Filing Date: November 05, 2001
Appellant(s): CREGER ET AL.

MAILED
SEP 05 2006
Technology Center 2100

Panyin A. Hughes
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed May 17, 2006, appealing from the Office action mailed September 8, 2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

2002/0138240	JELLEY ET AL.	9-2002
6,411,908	TALBOTT	6-2002

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

A. The rejection of claims 1-5, 7, and 8 under 35 U.S.C. §102(e)

Claim 1-5 and 7-8 are rejected under 35 U.S.C. 102(e) as being anticipated by Jelley et al., U.S. Patent Application Publication 2002/0138240 A1 published September 26, 2002 and filed April 2, 2002.

A-1. Regarding claim 1, Jelley et al. disclose a method for compensating for variations in modeled parameters of a plurality of machines having similar characteristics and performing similar operations, including the steps of:

establishing a model development machine having a first at least one model to predict a machine parameter (Training the neural network, paragraph [0061]);

establishing at least one test machine having a second at least one model to predict the machine parameter (measured operating characteristics from tests, paragraph [0020]);

obtaining data relevant to predicting the machine parameter on the at least one test machine and relevant to the characteristics and operations of the at least one test machine (input design parameters and operating conditions, paragraph [0019]);

comparing the data from the at least one test machine to corresponding data of the model development machine (training the neural network, paragraph [0020]); and

updating at least one of an estimator and a model of each at least one test machine in response to variations in the compared data (training the neural network and generating a numeric algorithm from the trained neural network, paragraph [0020]).

A-2. Regarding claim 2, Jelley et al. further disclose each of the model development machine and the at least one test machine includes a neural network for modeling a parameter of each respective machine (neural network, paragraph [0020]), and wherein updating at least one of an estimator and a model includes the step of updating an estimator for each neural network in response to variations in the compared data (training the neural network and predicts an operating characteristic, paragraph [0020]).

A-3. Regarding claim 3, Jelley et al. further disclose each of the model development machine and the at least one test machine includes a neural network for modeling a parameter of each respective machine (neural network, paragraph [0020]), and wherein updating at least one of an estimator and a model includes the step of updating each neural network in response to variations in the compared data (training the neural network and generating a numeric algorithm, paragraph [0020]).

A-4. Regarding claim 4, Jelley et al. further disclose obtaining data includes the step of obtaining data from each test machine relevant to operating characteristics of each respective test machine (operating characteristics, paragraph [0025]).

A-5. Regarding claim 5, Jelley et al. further disclose obtaining data includes the step of obtaining data from a work site in which a respective test machine is located, the data including data relevant to characteristics of the work site and operations of the test machine at the work site (rock type (depends on work site), paragraph [0024]).

A-6. Regarding claim 7, Jelley et al. disclose a method for compensating for variations in modeled parameters of a test machine compared to a model development machine, including the steps of:

delivering a neural network model from the model development machine to the test machine (integrated into a program in a digital computer or other suitable device, paragraph [0064]);

determining a computed parameter on the test machine (operating characteristics, paragraph [0062]);

estimating the parameter on the test machine with the delivered neural network (predicts the operating characteristics, paragraph [0062]);

comparing the computed parameter with the estimated parameters (to test how well the neural network predicts the operating characteristics, paragraph [0062]); and

updating at least one of an estimator and the neural network model on the test machine in response to variations in the computed parameter and the estimated parameter (Training the neural network, paragraph [0061]).

A-7. Regarding claim 8, Jelley et al. further disclose determining a parameter includes the step of calculating the parameter (averaging the data over 0.5 second intervals, paragraph [0060]).

B. The rejection of claims 6, 10-12 under 35 U.S.C. §103(a)

Claims 6 and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jelley et al., U.S. Patent Application Publication 2002/0138240 A1 published September 26, 2002 and filed April 2, 2002, in view of Talbott, U.S. Patent 6,411,908 B1 issued June 25, 2002, and filed August 2, 2000.

B-1. Regarding claim 6, Jelley et al. fail to expressly disclose obtaining data includes the step of obtaining data relevant to aging of each test machine. Although the existing prior art methods

generally assume that the wear rate is substantially constant over the life of the drill bit, Jelley et al. suggest that it may not be true (paragraph [0015]).

Talbott discloses "Probabilistic modeling of machine life and other non-parametric reliability methods developed over the past five decades consider only age, and not condition, as a predictor of remaining life". "Now that new sensor technologies offer a means to track condition as well as age, better estimates of residual life can result (Talbott, column 1, lines 18-24). In other words, considering the fact that the wear rate may not be constant over the life of a machine, both condition and age should be taken into account.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Jelley et al. to incorporate the teachings of Talbott to obtain the invention as specified in claim 6 to take into account the fact that the wear rate may not be constant over the life of a machine as suggested by Jelley et al.

B-2. Regarding claim 10, Jelley et al. disclose a method for compensating for variations in modeled parameters of a plurality of machines having similar characteristics and performing similar operations with the use of a computer having a processor, including the steps of:

sensing data from each of the plurality of machines relevant to the modeled parameters, characteristics, and operations of each respective machine (inputting each measured operating characteristic for each set of design parameters and each set of operating conditions, paragraph [0061]);

transmitting the data to the processor (into a digital computer, paragraph [0061]);

determining a level of variability of the characteristics of each machine as a function of the data (operating conditions, paragraph [0024]; Training the neural network, paragraph [0061]);

determining a level of variability of the operations of each machine relevant to a respective work site as a function of the data (rock type (depends on work site), paragraph [0024]; Training the neural network, paragraph [0061]);

updating at least one of an estimator and a model of each machine encoded in the computer in response to the level of variability of the characteristics of each machine, the level of variability of the operations of each machine relevant to each work site (provide neural network computations, paragraph [0061]).

Jelley et al. fail to expressly disclose determining an aging factor of each machine as a function of the data and updating at least one of an estimator and a model of each machine encoded in the computer in response to the aging factor. Although the existing prior art methods generally assume that the wear rate is substantially constant over the life of the drill bit, Jelley et al. suggest that it may not be true (paragraph [0015]).

Talbott discloses "Probabilistic modeling of machine life and other non-parametric reliability methods developed over the past five decades consider only age, and not condition, as a predictor of remaining life". "Now that new sensor technologies offer a means to track condition as well as age, better estimates of residual life can result" (Talbott, column 1, lines 18-24). In other words, considering the fact that the wear rate may not be constant over the life of a machine, both condition and age should be taken into account.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Jelley et al. to incorporate the teachings of Talbott to obtain the invention as specified in claim 10 to take into account the fact that the wear rate may not be constant over the life of a machine as suggested by Jelley et al.

B-3. Regarding claim 11, Jelley et al. further disclose determining a level of variability of the operations of each machine relevant to a respective work site includes the step of determining a level of variability as a function of differences in characteristics between each work site (rock type (depends on work site), paragraph [0024]).

B-4. Regarding claim 12, Talbott further disclose determining an aging factor of each machine includes the step of determining a level of variability of operations of each machine as a function of aging of each respective machine (Talbott, track condition as well as age, column 1, lines 18-24).

C. The rejection of claim 9 under 35 U.S.C. §103(a)

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jelley et al., U.S. Patent Application Publication 2002/0138240 A1 published September 26, 2002 and filed April 2, 2002, in view of Applicants' assertions.

C-1. Regarding claim 9, Jelley et al. disclose a method for compensating for variations in modeled parameters in claim 7. However, Jelley et al. fail to expressly disclose updating a neural network model includes the step of tuning at least one weight in the neural network model. Applicants assert, as described in paragraph [35] of the specification, "In the preferred embodiment, updating the neural network 604 includes tuning at least one neural network weight

in the neural network. Neural network weights are well known in neural network theory and applications, and will not be described further."

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Jelley et al. to incorporate Applicants' assertions to obtain the invention as specified in claim 9 because updating a neural network by tuning weight in the neural network model is well known in neural network theory and applications as asserted by Applicants.

(10) Response to Argument

D. The rejection of claims 1-5, 7, and 8 under 35 U.S.C. §102(e)

D-1. Appellants argue, "Appellants have previously brought this difference between Jelley and the claimed invention to the Examiner's attention. In response, the Examiner stated that "the limitation, 'establishing a model development machine having a first at least one model to predict a machine parameter' is nothing more than providing a trained neural network disclosed in Jelley." See Advisory Action Before the Filing of an Appeal Brief at page 4. This assertion ignores the fact that providing a trained neural network requires only one model, whereas claims 1-5 and 7-8 require at least two models and two machines. ... Jelley does not disclose nor suggest the use of two models. Thus, Jelley cannot anticipate claims 1-5, 7, and 8." (Page 13, paragraph 3, through page 14, paragraph 1, Appeal Brief).

The Examiner respectfully disagrees with the Appellants' argument.

First, as described at page 7, paragraph [32], "Preferably, the neural network model 802 of the model development machine 104 offers the advantage of having "learned" over a long

period of time, under controlled conditions." It confirms that the neural network model of the model development machine is nothing more than providing a trained baseline neural network.

Second, as described at page 6, paragraph [29], "In some circumstances, the model development machine 104 may function as a test machine 606" and at page 7, paragraph [32], "In a first control block 402, a neural network model 802 is delivered from the model development machine 104 to each test machine 106." In view of the specification, the neural network model of the test machine is delivered from the model development machine. Therefore, these two models (i.e., the neural network model on the model development machine and the delivered neural network model on the test machine) are the same before further updating the delivered neural network model on the test machine. Furthermore, "the model development machine 104 may function as a test machine 606" implies that they may be the same machine. In other words, during the baseline training stage, a machine having a trained baseline neural network would be a model development machine. Later on, when the same machine having the same trained baseline neural network is ready to have a fine-tuning at the specific work site it functions as a test machine. Accordingly, in view of the specification, Jelley's steps for training a neural network anticipate the argued limitation.

D-2. Appellants argue with respect to independent claim 1, "Jelley does not disclose or suggest comparing the data from the at least one test machine to corresponding data of the model development machine, or updating at least one of an estimator and a model of each at least one test machine in response to variations in the compared data." (Page 15, paragraph 2, Appeal Brief).

The Examiner respectfully disagrees with the Appellants' argument. Comparing and updating steps are both anticipated by Jelley at paragraph [0020]. Step d) training the neural network is further detailed at paragraph "[0061] Training the neural network is accomplished by inputting each measured operating characteristic for each set of drill bit design parameters and each set of operating conditions into a digital computer (or in another suitable neural network device) programmed to provide neural network computations." Comparing variations and accordingly updating neural network are well known and inherent steps in neural network computations for training a neural network. As described at page 7, paragraph [35], Appellants also assert, "In the preferred embodiment, updating the neural network 604 includes tuning at least one neural network weight in the neural network. Neural network weights are well known in neural network theory and applications, and will not be described further." Therefore, in claim 1, Jelley's "training a neural network" anticipates both the "comparing" and "updating" steps. Furthermore, the updating one neural network weight anticipates the limitation "updating ... an estimator" and updating one or more neural network weights anticipates the limitation "updating ... a model". Because a test machine has a trained baseline neural network delivered from a model development machine the "comparing" and "updating" steps represent fine-tuning for a specific work site. Accordingly, Jelley's generated "numeric algorithm from the trained neural network" represents a fine-tuned and locally trained neural network model.

D-3. Appellants argue, "In contrast, claim 7 relies upon both the developmental machine and the test machine to include neural network models to predict machine parameters. Specifically, claim 7 requires "delivering a neural network model <u>from</u> the developmental machine <u>to</u> the test machine" and "updating at least one of an estimator and <u>the neural network model on the test</u>

machine." (emphasis added). In other words, whereas Jelley employs a single neural network to predict operating characteristics of earth boring drills, Applicants' disclosure in claim 7 employs two neural network models, one with the developmental machine and the other with the test machine. Therefore, Jelley cannot anticipate claim 7." (Page 16, paragraph 1, Appeal Brief).

The Examiner respectfully disagrees with the Appellants' argument. As described at page 6, paragraph [29], "In some circumstances, the model development machine 104 may function as a test machine 606" and at page 7, paragraph [32], "In a first control block 402, a neural network model 802 is delivered from the model development machine 104 to each test machine 106." In view of the specification, the neural network model of the test machine is delivered from the model development machine. Therefore, these two models (i.e., the neural network model on the model development machine and the delivered neural network model on the test machine) are the same before further updating the delivered neural network model on the test machine. Furthermore, "the model development machine 104 may function as a test machine 606" implies that they may be the same machine. In other words, during the baseline training stage, a machine having a trained baseline neural network would be a model development machine. Later on, when the same machine having the same trained baseline neural network is ready to have a fine-tuning at the specific work site it functions as a test machine. Accordingly, in view of the specification, Jelley's steps for training a neural network anticipate the argued limitation.

D-4. Appellants argue with respect to independent claim 7, "Jelley does not disclose or suggest comparing the computed parameter with the estimated parameter, or updating at least one of an estimator and the neural network model on the test machine in response to variations in the

computed parameter and the estimated parameter." (Page 16, paragraph 2, through page 17, paragraph 1, Appeal Brief).

The Examiner respectfully disagrees with the Appellants' argument. Comparing and updating steps are anticipated by Jelley at paragraph [0062] and paragraph [0061] respectively. Although comparing variations and accordingly updating neural network are well known and inherent steps in neural network computations for training a neural network, paragraph [0061] does describe training the neural network by inputting data into a digital computer programmed to provide neural network computations and paragraph [0062] does describe to test how well the neural network predicts the operating characteristics. Furthermore, as described at page 7, paragraph [35], Appellants also assert, "In the preferred embodiment, updating the neural network 604 includes tuning at least one neural network weight in the neural network. Neural network weights are well known in neural network theory and applications, and will not be described further." Therefore, in claim 7, Jelley's "to test how well the neural network predicts the operating characteristics" anticipates the "comparing" step and "training a neural network" anticipates the "updating" step.

D-5. Appellants argue, "Claims 2-5, 8, and 9 each depend either directly or indirectly from one of independent claims 1 and 7, and each is therefore allowable for at least the same reasons stated above with respect to claims 1 and 7." (Page 17, paragraph 2, Appeal Brief).

The Examiner respectfully disagrees with the Appellants' argument because Appellants rely on the patentability of the independent claims 1 and 7 for dependent claims 2-5, 8, and 9 without arguing any claimed distinct feature.

E. The rejection of claims 6, 10-12 under 35 U.S.C. §103(a)

E-1. Appellants argue, "The Final Office Action concedes that Jelley fails to "expressly disclose determining an aging factor of each machine as a function of the data and updating at least one of an estimator and a model of each machine encoded in the computer in response to the aging factor." Final Office Action at page 7. Consequently, the Office Action relies on Talbott for this teaching. Even if Talbot does teach determining an aging factor of each machine as a function of the data and updating at least one of an estimator and a model of each machine encoded in the computer in response to the aging factor, the combination of Jelly and Talbot will not result in the claimed invention. Specifically, Talbott does not remedy the deficiencies of Jelley discussed above. Jelley does not disclose "updating at least one of an estimator and a model of each machine encoded in the computer." (Page 17, Paragraph 4, through page 18, Paragraph 2, Appeal Brief).

Although presumed by the Appellants, Talbott does teach "determining an aging factor of each machine as a function of the data and updating at least one of an estimator and a model of each machine encoded in the computer in response to the aging factor" (as a matter of fact, disclosed by the combined teaching of Jelley and Talbott), the Examiner respectfully disagrees with the Appellants' other argument. Specifically, "Updating at least one of an estimator and a model of each machine encoded in the computer" is anticipated by Jelley at paragraph [0061] as "Training the neural network". As described at paragraph [0061], training the neural network is accomplished by inputting data into a digital computer programmed to provide neural network computations and "the best fit of the input parameters and conditions with the tested output characteristics is represented in numerical form". The "digital computer programmed to provide

neural network computations" that includes finding the best fit as well as incorporating the best fit into the numerical form by updating the model anticipates the argued limitation.

E-2. Appellants argue, "Claims 11 and 12 depend from claim 10 and are therefore allowable for at least the same reasons stated above that claim 10 is allowable." (Page 18, paragraph 3, Appeal Brief).

The Examiner respectfully disagrees with the Appellants' argument because Appellants rely on the patentability of the independent claim 10 for dependent claims 11 and 12 without arguing any claimed distinct feature.

E-3. Appellants argue, "Therefore, claim 6 is allowable for at least the same reasons that claim 1 is allowable as discussed above." (Page 19, paragraph 1, Appeal Brief).

The Examiner respectfully disagrees with the Appellants' argument because Appellants rely on the patentability of the independent claim 1 for dependent claim 6 without arguing any claimed distinct feature.

F. The rejection of claim 9 under 35 U.S.C. §103(a)

F-1. Appellants argue, "The Office Action relies on Applicants' assertions that "[n]eural network weights are well known in neural network theory and applications." See Final Office Action, pages 8-9. However, this assertion does not cure the deficiencies noted above regarding Jelley. Moreover, claim 9 depends from independent claim 7 and is therefore allowable for at least the same reasons that claim 7 is allowable." (Page 19, Paragraph 3, Appeal Brief).

At first, the Examiner respectfully disagrees with the Appellants' alleged deficiencies regarding Jelley as detailed in items **D-3** and **D-4** above.

As for claim 9, Jelley et al. disclose a method for compensating for variations in modeled parameters in claim 7. However, Jelley et al. fail to expressly disclose updating a neural network model includes the step of tuning at least one weight in the neural network model. Appellants assert, as described at paragraph [35] of the specification, "In the preferred embodiment, updating the neural network 604 includes tuning at least one neural network weight in the neural network. Neural network weights are well known in neural network theory and applications, and will not be described further."

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Jelley et al. to incorporate Appellants' assertions to obtain the invention as specified in claim 9 because updating a neural network by tuning weight in the neural network model is well known in neural network theory and applications as asserted by Appellants.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Herng-der Day H.D.
August 20, 2006

Conferees:

Kamini S. Shah

Paul L. Rodriguez

KAMINI SHAH
SUPERVISORY PATENT EXAMINER

PAUL RODRIGUEZ
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100